Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Transforming the 2.5 GHz Band	)	WT Docket No. 18-120
	)	

COMMENTS OF VERIZON

The Commission is right to leave no stone unturned in trying to find more mid-band spectrum to make available for 5G. The availability of mid-band spectrum for 5G will be key for the United States to maintain global 5G leadership. The Commission is already focused on other critical mid-band spectrum – including notably the 3.5 GHz band and the 3.7-4.2 GHz – and should move quickly to put portions of those bands to use for 5G. But the 2.5 GHz band constitutes the single largest band of contiguous spectrum below 3 GHz that could be used for 5G. With significant portions of the band lying fallow across about half of the county, the Commission is right to explore ways to make the band an effective and efficient source of spectrum for 5G.

I. Mid-Band Spectrum Is a Critical Component of the 5G Equation.

Recent data verify the exponential growth in demand for wireless services. Total U.S. mobile data traffic reached almost 15.7 trillion megabytes in 2017, up *2 trillion megabytes* and 15 percent from 2016.[1] And U.S. mobile data traffic is expected to grow at a 35 percent

[1] CTIA, The State of Wireless 2018, at 4 (2018), https://api.ctia.org/wp-content/uploads/2018/07/CTIA_State-of-Wireless-2018_0710.pdf ("CTIA State of Wireless 2018").

compound annual growth rate, reaching nearly 4.6 exabytes per month by 2021.[2] Verizon continues to increase network capacity and improve network performance by aggressively developing and deploying the most advanced infrastructure and technologies, including small cells, distributed antenna systems, in-building solutions, and LTE Advance features.[3] These efforts alone, however, will not be enough.

As the Commission well knows, the race to 5G is on and it is global. 5G will usher in nothing short of a Fourth Industrial Revolution, providing the foundation for smart cities, telehealth, the Internet of Things and other innovations that will change the way we communicate and live. It will be 100 times faster, five times more responsive, and able to connect 100 times more devices than 4G. 5G will support the dynamic and scalable networks needed to power the Internet of Things. In a 5G world, not just people but things will be connected, such as cars to roads and roads to traffic lights, and soil sensors to irrigation systems and surgeons to robotic arms. And the connections will be instantaneous. Deploying 5G networks will benefit countless industries – agriculture, retail, healthcare, automotive, industrial, entertainment, and many more – and lead us into a world of "smart cities." Verizon is already showcasing some of the potential applications for 5G, such as virtual and augmented reality applications, 360 degree and intelligent video, and autonomous vehicles uses.[4] And Verizon will

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[2] Cisco, V*NI Mobile Forecast Highlights, 2016-2021, Find highlights based on location and category*, http://www.cisco.com/assets/sol/sp/vni/forecast_highlights_mobile/#~Country (last visited July 12, 2018).

[3] News Release, Verizon, *Verizon continues industry-leading LTE Advanced network deployments* (July 13, 2018), https://www.verizon.com/about/news/verizon-continues-industry-leading-lte-advanced-network-deployments.

[4] *See, e.g.*, "How 5G will improved augmented and virtual reality," Verizon Media Center (June 27, 2018), available at https://www.verizon.com/about/news/how-5g-will-improve-augmented-and-virtual-reality (last visited July 31, 2018); "Verizon and Ericsson showcase technology milestones and use cases demonstrating continued industry leadership in LTE, path to 5G at 2017 Mobile World Congress," Verizon Media Center (Sept. 11, 2017), available at

launch fixed 5G in Houston, Los Angeles, Sacramento, and one other city in the second half of 2018, and 5G mobile services shortly thereafter.[5]

To fuel this revolution and ensure that U.S. industry is at the forefront of the next generation of wireless services, the Commission and its federal partners must make spectrum available in time for these types of innovation, not wait until after a crisis develops. While the Commission recently has taken key steps to make more spectrum available for 5G, more must be done.[6] While high-band spectrum – with its ability to provide high-capacity, high-speed, and low-latency broadband service – will be very important to the 5G equation, mid-band spectrum could fill the critical gap between the high-band and low-band spectrum that will continue to serve as the foundation for network coverage and eventually fold into the 5G network architecture. Mid-band spectrum could be used in conjunction with high-band spectrum to leverage the optimal capacity and coverage possibilities provided by each. For example, millimeter wave spectrum could be used for downlink and mid-band spectrum for uplink.[7] Or millimeter wave spectrum could be used for user plane data and mid-band spectrum for control

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http://www.verizon.com/about/news/verizon-and-ericsson-showcase-technology-milestones-and-use-cases-demonstrating-continued.

[5] To the future, faster: Verizon 5G news and updates, https://www.verizon.com/about/our-company/5g (last visited July 31, 2018).

[6] *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 8014 (2016); *Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Notice of Inquiry, 32 FCC Rcd 6373 (2017); *24 GHz Second R&O*, 32 FCC Rcd 10988; *Auctions of Upper Microwave Flexible Use Licenses for Next-Generation Wireless Services*, Public Notice, FCC 18-43 (rel. Apr. 17, 2018); *Amendment of Parts 1, 21, 73, 74 and 101 of the Commission's Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational and Other Advanced Services in the 2150-2162 and 2500-2690 MHz Bands*, Notice of Proposed Rulemaking, FCC 18-59 (rel. May 10, 2018); *Amendment of Part 90 of the Commission's Rules*, Sixth Further Notice of Proposed Rulemaking, FCC 18-33 (rel. Mar. 23, 2018); *Promoting Investment in the 3550-3700 MHz Band*, Notice of Proposed Rulemaking and Order Terminating Petitions, 32 FCC Rcd 8071 (2017).

[7] *See, e.g.*, Description of Phazr Technology, available at http://phazr.net/technology/.

plane information.[8] The potential applications of networks operating across low, mid, and high bands are limitless and are only beginning to materialize. The international race to 5G will thus not be won in the high bands alone, but across the entire range of frequencies.

II. The Commission Is Right To Consider How To Better Use the 2.5 GHz Band.

The Commission is correctly looking at new spectrum allocations for mobile wireless in the mid-band, such as the 3.7-4.2 GHz band,[9] but how much spectrum could be made available in that band remains unclear and there is little other mid-band spectrum on the horizon that could be used for 5G. The Commission is thus also right to look at existing mid-band allocations that could be used more effectively and efficiently. The 2.5 GHz band, in particular, has been underused for decades. Incumbent EBS licenses in the 2.5 GHz band cover only about half of the geographic area of the United States in each channel, leaving the remaining half of EBS spectrum unassigned including in irregularly shaped areas that may be difficult to license as is.[10] And while the original goal of the band was laudable, time has shown that educational institutions have other means to accomplish distance learning goals so special purpose spectrum is no longer necessary. The Commission's allowance of leasing of the band helped offer some flexibility,[11] but the irregular shape of the licenses resulting from the original licensing scheme,

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[8] *See, e.g.*, Intel presentation of 5G technology (describing a modem supporting 28 GHz and 3.3 to 4.2 GHz), available at https://newsroom.intel.com/newsroom/wp-content/uploads/sites/11/2017/01/5G-pr-briefing.pdf.

[9] *Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, GN Docket No. 18-122, Notice of Proposed Rulemaking, FCC 18-91 (July 13, 2018).

[10] *Transforming the 2.5 GHz Band*, WT Docket No. 18-120, Notice of Proposed Rulemaking, FCC 18-59, ¶ 5 (May 10, 2018) ("NPRM").

[11] *Amendment of Parts 2, 21, 74, and 94 of the Commission's Rules and Regulations in regard to Frequency Allocation to the Instructional Television Fixed Service, the Multipoint Distribution Service, and the Private Operational Fixed Microwave Service*, Report and Order, 94 FCC 2d 1203 (1983); *Amendment of Parts 1, 21, 73, 74 and 101 of the Commission's Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational and Other Advanced Services*

the continuing educational requirement, and the long-term leases that many EBS licensees entered into continue to limit the feasibility of this spectrum being used for effectively and efficiently for next generation wireless services.

The Commission posits a number of alternative ways to make better use of the band.[12] For example, it proposes a white spaces auction to make unlicensed EBS spectrum available to all entities that are interested in using the spectrum. Such an auction could help free up the EBS spectrum not currently used. And if it were willing to go further and consider more fundamental reforms, it could transform the band to further help spur 5G deployment.

In times of great need for additional flexible use spectrum, the Commission has consistently ensured that industry could access the necessary resources to meet consumer demand. It is clear that mid-band spectrum will be critical to the deployment of 5G. Verizon appreciates that the Commission recognizes as much and is looking everywhere it can, including the 2.5 GHz band, to try and make more mid-band spectrum available for 5G.

Sincerely,

/s/

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in the 2150-2162 and 2500-2690 MHz Bands, Report and Order and Further Notice of Proposed Rulemaking, 19 FCC Rcd 14165 (2004).

[12] *See* NPRM ¶ 58 (seeking comment on other approaches to rationalizing and opening up the 2.5 GHz band).